**AST104 Sp2004: EXAM 1**

**Multiple Choice Questions: Mark the best answer choice. Read all answer choices before making selection. (No credit given when multiple answers are marked.)**

**1.** A galaxy contains

a. no planets

b. gas, dust, and stars

c. lots of gas and dust but few stars

d. a single star and planets

e. thousands of galaxy clusters

**2.** Which is the largest?

a. diameter of the Earth

b. diameter of Jupiter

c. diameter of the sun

d. distance between the Earth and sun

e. distance between Mercury and the sun

**3.** $5\times10^8$ is the same as

a. $5 \times 10^4 \times 10^4$

b. $5 \times 10^4 \times 10^2$

c. 500 million

d. a and c

e. 50 million

**4.** If a galaxy is 1000 light years away, the light that we observe from it

a. was produced $10^3$ years ago in that galaxy

b. was produced 10 years ago in that galaxy

c. was produced at the instant we observe

d. comes in radio waves only

e. is a sign of life in that galaxy

**5.** If light takes about $10^{-5}$ years to reach the Earth from the sun, and a nearby star is 5 light years away, then the distance from the sun to the nearest star in astronomical units is most nearly

a. 0.5 AU

b. 5 AU

c. 50 AU

d. $5\times10^5$ AU

e. $5 \times10^{20}$ AU

**6.** When are the celestial equator and the ecliptic most widely separated on the sky?

a. winter solstice and summer solstice

b. vernal equinox and autumnal equinox

c. they coincide at all times

d. at noon each day of the year

e. at midnight each day of the year

**7.** What is true about the seasons?

a. Earth is closer to the sun in the summer.

b. When it is winter in the northern hemisphere, it is summer in the southern hemisphere.

c. The period of direct sunlight in the northern hemisphere is longer during its winter.

d. The tilt of the Earth has nothing to do with the seasons.

e. a and d

**8.** If you live at latitude of 28 degrees North, what is the angle you observe between the northern horizon and North Celestial pole?

a. 62 degrees

b. 5 degrees

c. 90 degrees

d. 23.5 degrees

e. 28 degrees

**9.** The angular diameter of the sun is about 0.5 degrees. Since we know the sun can be eclipsed by the moon, the moon's angular diameter in arc minutes must be at least (60 arc min = 1 degree):

a. 0.5 arc minutes

b. 5 arc minutes

c. 50 arc minutes

d. 30 arc minutes

e. 120 arc minutes

**10.** The point in Mars' orbit when it is nearest to the sun is called the

a. aphelion

b. perihelion

c. heliocenter

d. apogee

e. pericenter

**11.** Of the following, which always occurs closest to the last day of winter?

a. a solar eclipse

b. winter solstice

c. summer solstice

d. autumnal equinox

e. vernal equinox

**12.** Star A has an apparent magnitude of -1 and star B has an apparent magnitude of -3. Star A appears approximately _____ Star B:

a. the same brightness as

b. $10^{10}$ times fainter than

c. 6.3 times brighter than

d. 6.3 times fainter than

e. $10^{10}$ times brighter than

**13.** An astronomer observes that Polaris is 40 degrees above her northern horizon. What can she say about her longitude from this?

a. nothing

b. that it is 40 degrees north

c. that it is 50 degrees south

d. that it is 40 degrees east

e. that it is 50 degrees west

**14.** A first quarter moon rises at about

a. noon

b. sunset

c. sunrise

d. midnight

e. the north celestial pole

**15.** An object has a measured angular diameter of 0.1 degrees. If this object were 10 times farther away, what would its angular diameter be?

a. 4 degrees

b. 0.01 degrees

c. 0.5 degrees

d. 0.05 degrees

e. 0.1 degrees

**16.** Solar or lunar eclipses occur

a. when the sun is near the line of nodes and the moon is new or full

b. at any new moon or full moon

c. usually at vernal or autumnal equinox

d. only at summer or winter solstice

e. only in our imagination

**17.** If 1/2 of the moon enters the umbra of Earth's shadow, the eclipse type is

a. partial

b. umbral

c. penumbral

d. total

e. annular

**18.** The time it takes for the moon to return to the same position on the sky with respect to the background stars ____ the time to return to the same position with respect to the sun.

a. is always equal to

b. is always less than

c. is always greater than

d. is mostly less but sometimes greater than

e. has never been measured, in contrast to

**19.** About 3 weeks after a solar eclipse we see

a. a new moon

b. a full moon

c. another solar eclipse

d. a third quarter moon

e. a waning gibbous moon

**20.** The sun is reddish not blueish at sunset

a. because red light has more energy

b. because red light has shorter wavelengths

c. because red light scatters more than blue

d. because red light scatters less than blue

e. only to color-blind folks

**21.** Ptolemy's model of the universe

a. was identical to the Copernican model

b. placed the Earth at the center

c. included precession of the Earth's axis

d. included all presently known planets

e. all of the above

**22.** Which discovery is NOT attributed to Galileo?

a. different mass objects dropped together from the same height take the same time to hit the ground

b. phases of Venus

c. elliptical orbits of planets

d. Jupiter's moons

e. sunspots

**23.** Two decades of data from planetary orbit observations was this person's most important scientific contribution.

a. Einstein

b. Newton

c. Kepler

d. Brahe

e. Aristarchus

**24.** Unlike Newton, Aristotle incorrectly be-

lieved that

a. a force is needed to keep an object in any kind of motion

b. planets move in elliptical orbits

c. force is equal to mass times acceleration

d. for every action, there is an equal and opposite reaction

e. the Earth is a flat disk

**25.** If a planet orbits the sun at a distance of 4AU, then its orbital period is

a. 2 years

b. 1/4 year

c. 4 years

d. 16 years

e. 8 years

**26.** Which of the following was NOT explained by Newton's theories?

a. how the line between between an orbiting planet and the sun always sweeps out equal areas in equal times during the orbit

b. how planets orbit around the sun in ellipses with the sun at one focus

c. the deflection of light from distant stars by the sun's gravity

d. how massive objects accelerate to the ground when dropped

e. Kepler's third law relating the orbit period to the orbital radius

**27.** The escape speed of a rocket with respect to Earth is given by $(2GM/r)^{1/2}$. In this equation:

a. r is the distance from the Earth's center to the satellite and M is the mass of Earth

b. r is the radius of the Earth and M is the mass of the rocket

c. r is the radius of the Earth and M is the mass of the Earth

d. r is the distance of the rocket from the Earth's center and M is the mass of the rocket

e. r is the distance from Earth's surface to the rocket and M is the mass of the Earth

**28.** The speed of a satellite in elliptical orbit around Earth is

a. greater than the escape speed when the satellite is closest to the Earth during the orbit

b. greater than the escape speed when the satellite is farthest from Earth during the orbit

c. always less than the escape speed

d. always greater than escape speed

e. always grossly inconsistent with the value predicted by Newton's laws.

**29.** Suppose the sun were 3 times farther from Earth as it is now. Which is true?

a. the sun would appear 1/9 as bright with a gravitational force on us 1/9 as strong.

b. the sun would appear 1/9 as bright with a gravitational force on us 1/3 as strong.

c. the sun would appear 1/3 as bright with gravitational force on us 1/9 as strong.

d. the sun would appear 1/6 as bright with gravitational force on us 1/6 as strong.

e. the sun would be at a distance 30 AU.

**30.** The _____ of an object is the always the same on the Earth and the Moon, but the

_____ differs.

a. temperature, mass

b. mass, weight

c. weight, mass

d. speed, weight

e. angular momentum, kinetic energy

**31.** If the Earth were 3 times more massive and 6 times farther from the sun, then the sun's gravitational force on the Earth would be

a. 3 times weaker than it is now

b. 2 times stronger than it is now

c. 12 times weaker than it is now

d. 4 times stronger than it is now

e. 4 times weaker than it is now

**32.** Which would astronomers consider LEAST important when buying a telescope?

a. light-gathering power

b. resolving power

c. lens and mirror quality

d. magnifying power

e. stability of the mounting and accuracy of the positioning apparatus

**33.** A telescope with a 5 meter objective mirror diameter gathers ____ times more light and can resolve objects of ____ the angular diameter when compared to a 1 meter telescope.

a. 25, 1/5

b. 5, 1/25

c. 25, 1/25

d. 5, 1/5

e. 10, 1/100

**34.** Visible light corresponds to a lower frequency range than _____?

a. Gamma-rays

b. Infrared radiation

c. Ultra-violet radiation

d. x-rays

e. a,c,d above

**35.** X-ray Radiation from a distant galaxy

a. will not penetrate Earth's atmosphere

b. has a wavelength shorter than UV-rays emitted by the galaxy

c. has a wavelength shorter than Gamma-rays emitted by the galaxy

d. a and b

e. b and c

**36.** The optical Hubble Space Telescope performs better in space than it would on Earth's surface because

a. gamma-radiation interferes with telescopes near the Earth's surface

b. the seeing is better in space

c. there is more turbulent air in space than in the Earth's atmosphere

d. all optical light is completely absorbed by the Earth's atmosphere

e. b and d

**37.** Which is best for looking at the faintest sources and has the least chromatic aberration?

a. a small diameter reflecting telescope

b. a small diameter refracting telescope

c. a large diameter refracting telescope

d. a pinhole camera

e. a large diameter reflecting telescope

**38.** If source A emits radio waves at a frequency 4 times that of source B, then the wavelength of radio waves from A is

a. the same as that from B

b. 16 times smaller than that from B

c. 16 larger than that from B

d. 4 times larger than that from B

e. 4 times smaller than that from B

**39. Spring tides can occur**

a. at new moon and first quarter moon

b. at first quarter and third quarter moon

c. during a solar eclipse

d. at new moon and full moon

e. c and d

**True or False**:

**40.** X-ray telescopes can be effective from the ground, but only far away from the light pollution of big cities.

**41.** If there were a second moon orbiting Earth every 24 hours, this second moon would necessarily be be closer to Earth than our present moon.

**42.** The amount of energy a photon carries depends on its wavelength.

**43.** Not all solar eclipses are annular eclipses because the moon follows an elliptical orbit.

**44.** Two objects with different measured angular diameters cannot be at the same distance.

**45.** Most modern ground based optical telescopes are reflecting telescopes.

**46.** The sidereal drive on a telescope mounting turns the telescope westward about the polar axis to remain pointed toward a distant object.

**47.** An object in an elliptical orbit experiences no acceleration.

**48.** An object in a circular orbit experiences no acceleration.

**49**. Einstein's theory of gravity can explain subtle features of Mercury's orbit around the sun and the deflection of light passing near a massive object.

**50**. If Earth had the same mass as its moon, the two objects would orbit about a point very nearly equal to 1/2 the distance between them.